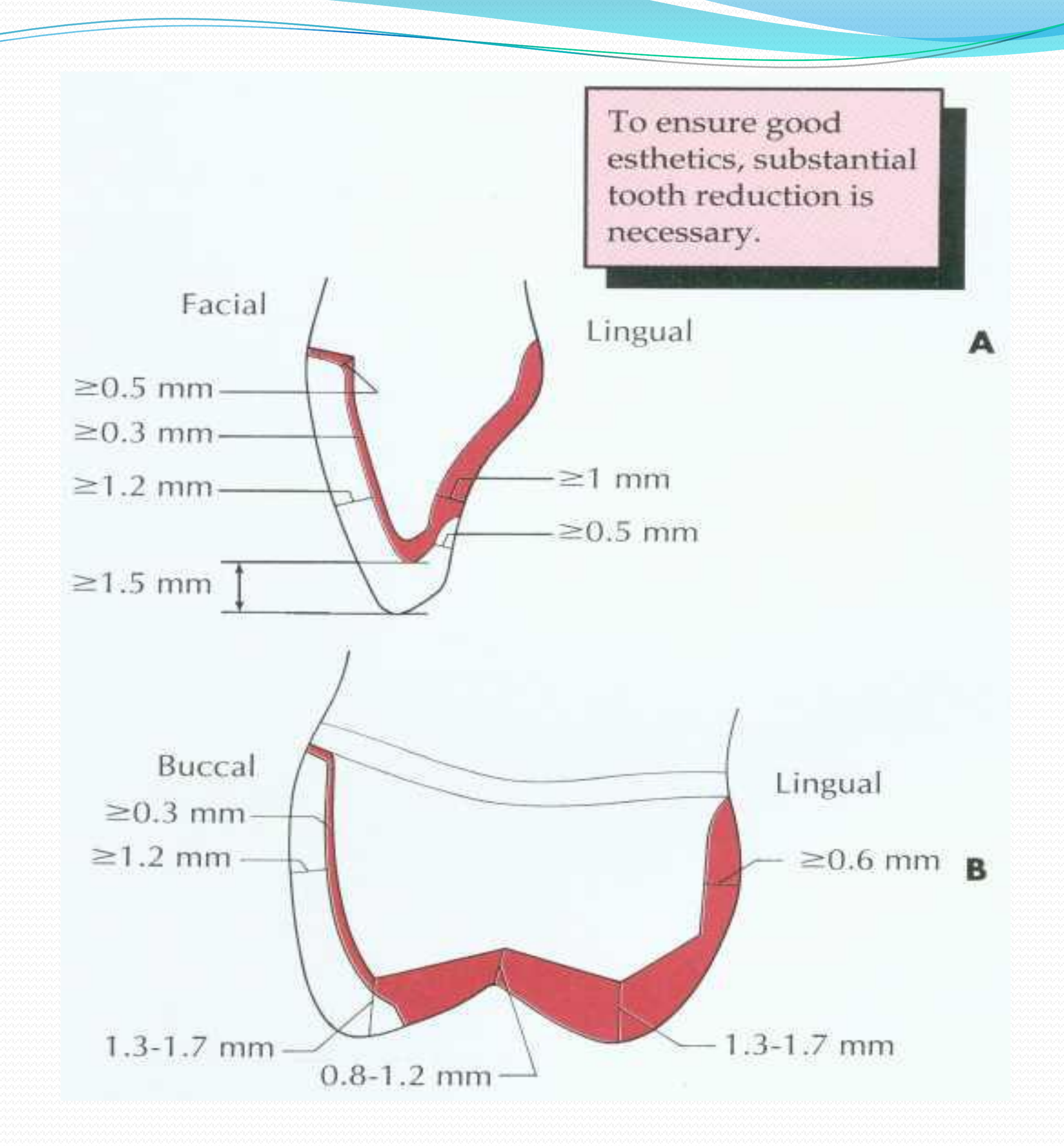
THE CERAM0-METALLIC RESTORATION

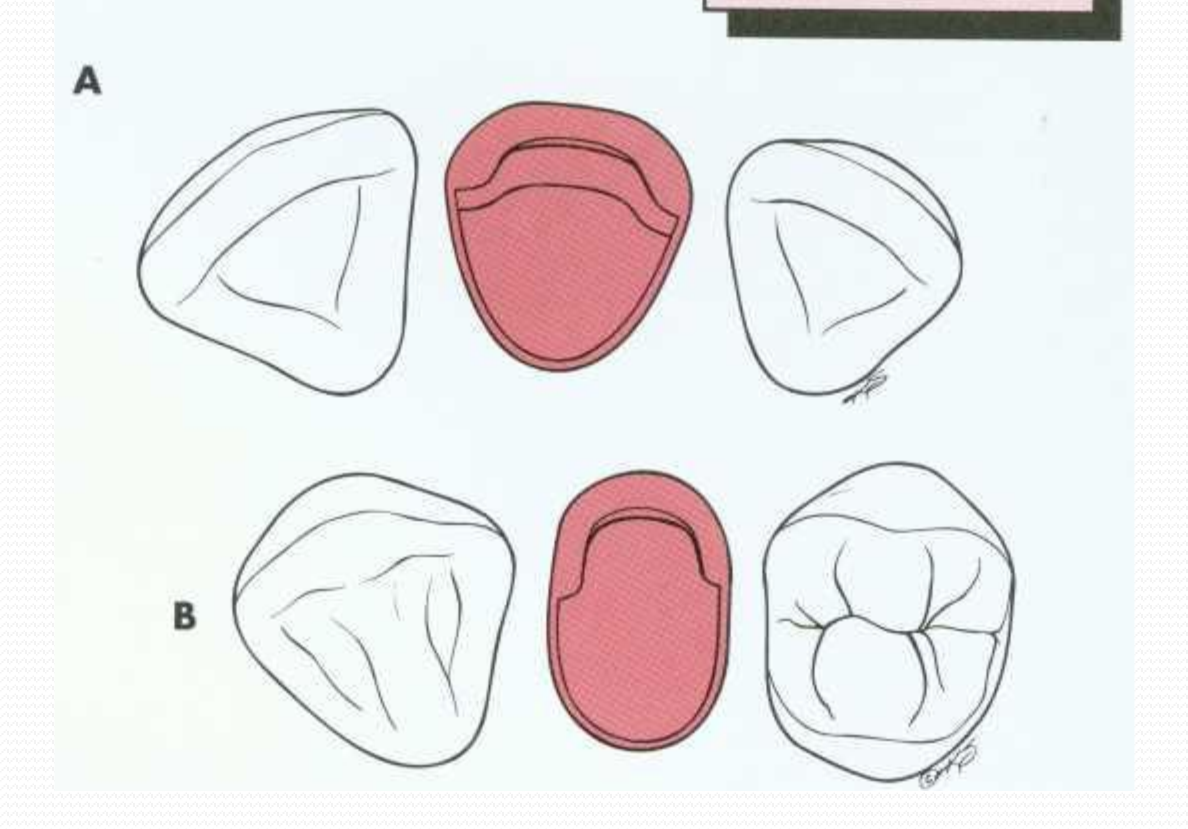
DR AHMAD EL-KOUEDI

LECTURER OF CROWN AND FIXED PROSTHODONTICS

DEFINITION

- IT IS A FULL COVERAGE RESTORATION THAT COMBINES THE STRENGTH AND ACCURACY OF A METAL SUBSTRACTURTE & THE ESTHETIC AND BIOLOGICAL COMPATABILITY OF PORCELAIN
- ALSO KNOW AS: METAL CERAMIC REST. (MCR)
- PORCELAIN FUSED TO METAL (PFM)


To ensure good esthetics, substantial tooth reduction is necessary.
Facial
Lingual
A
≥0.5 mm
≥0.3 mm
≥1.2 mm
≥1 mm
≥0.5 mm
≥1.5 mm
Buccal
Lingual
≥0.3 mm
≥1.2 mm
≥0.6 mm
B
1.3-1.7 mm
0.8-1.2 mm
1.3-1.7 mm


To ensure esthetics, the shoulder margin must extend into the interproximal area.
A
B

ADVANTAGES/ DISAVANTAGES

- GOOD RETENTION
- GOOD ESTHETICS
- DURABLE, MOST WIDELY USED RESTORATION
- CAN BE EASILY PREPARED
- DIS:
- MORE TOOTH REDUCTION
- PORCELAIN CAN FRACTURE
- MORE EXPENSIVE THAN FULL METAL







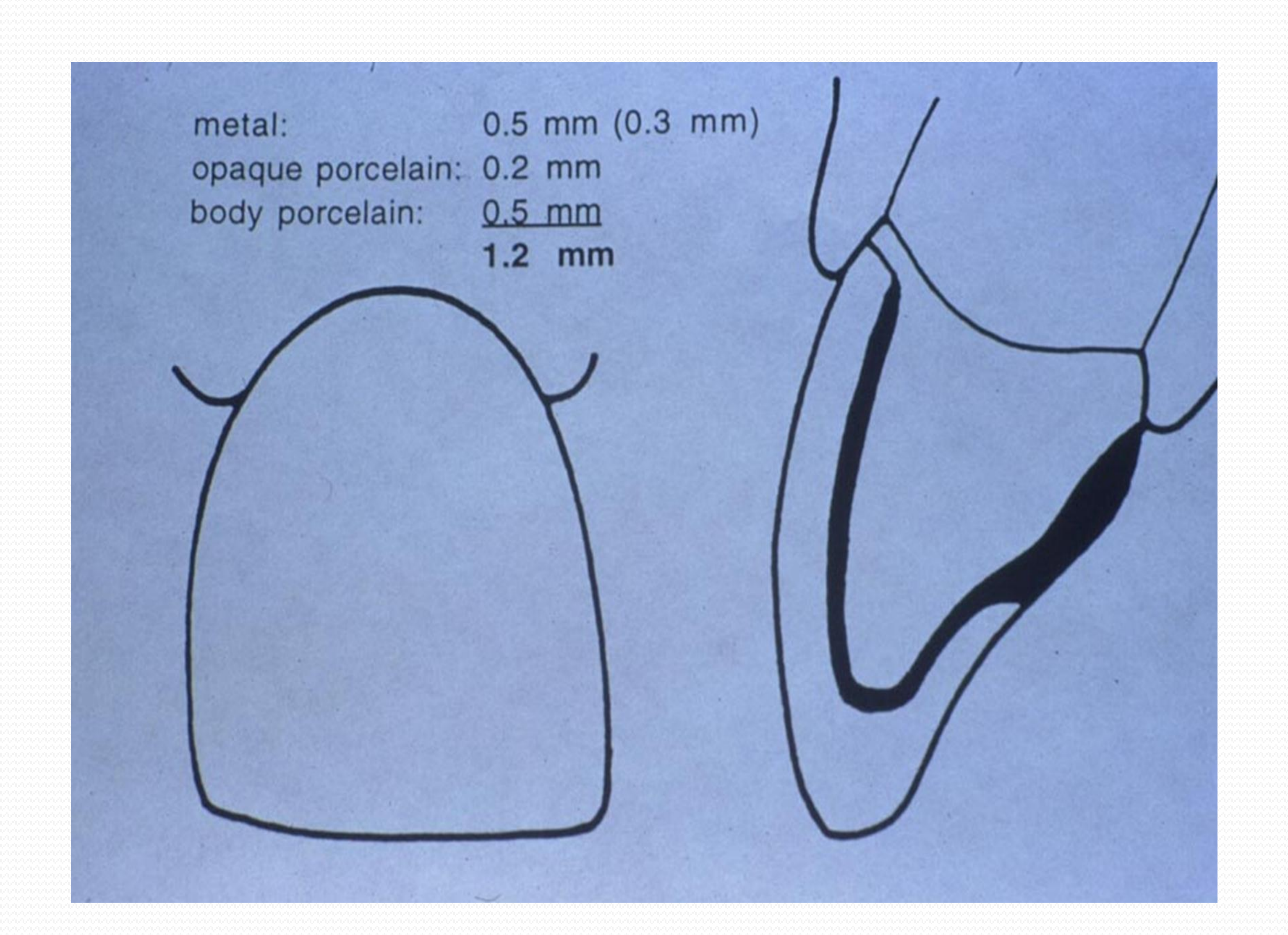
COMPONENTS

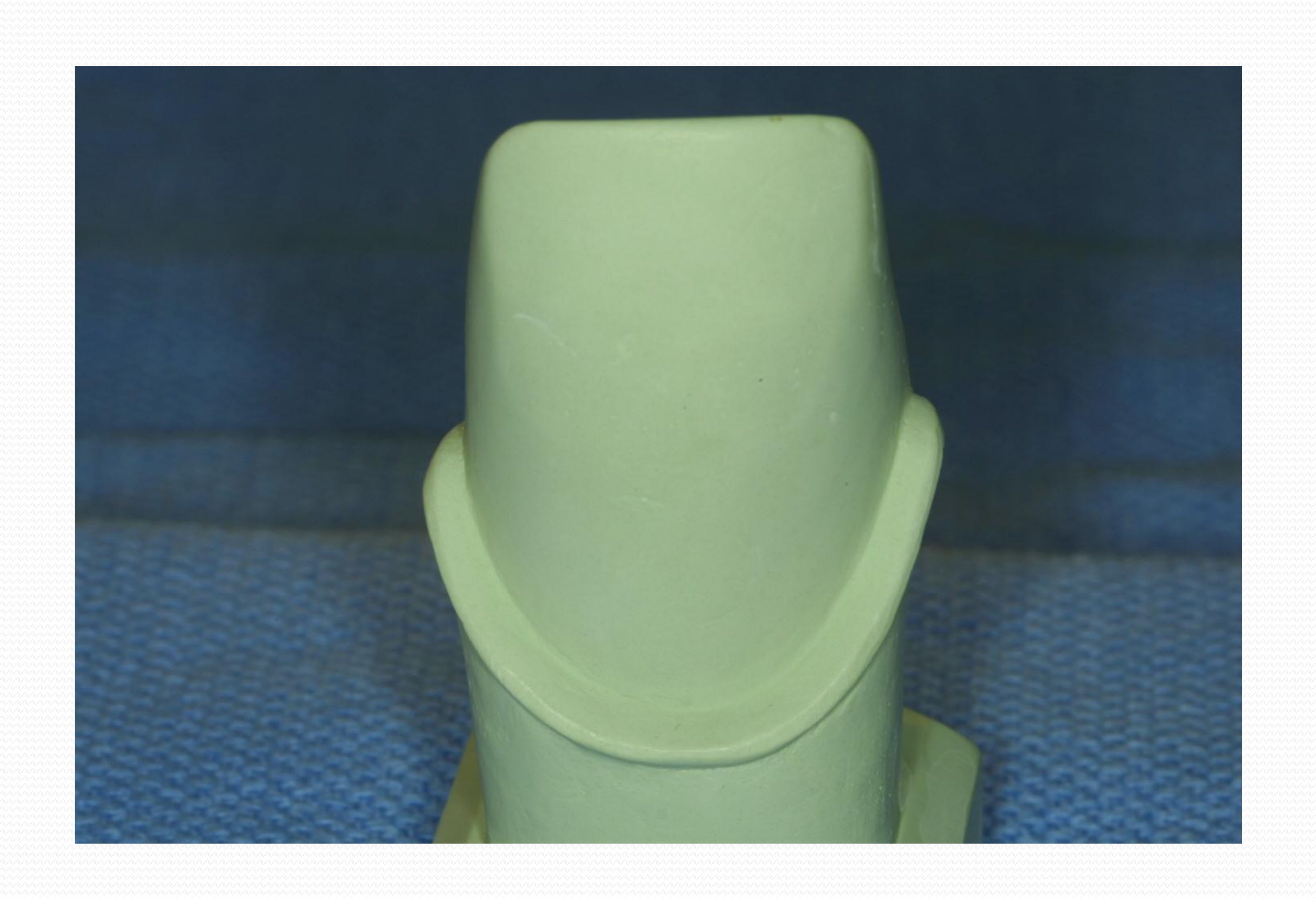
- METAL SUBSTRUCTURE: thin smooth coping with no anatomy in case of full veneered or partial anatomy in case of veneered crown
- PORCELAIN VENEER:

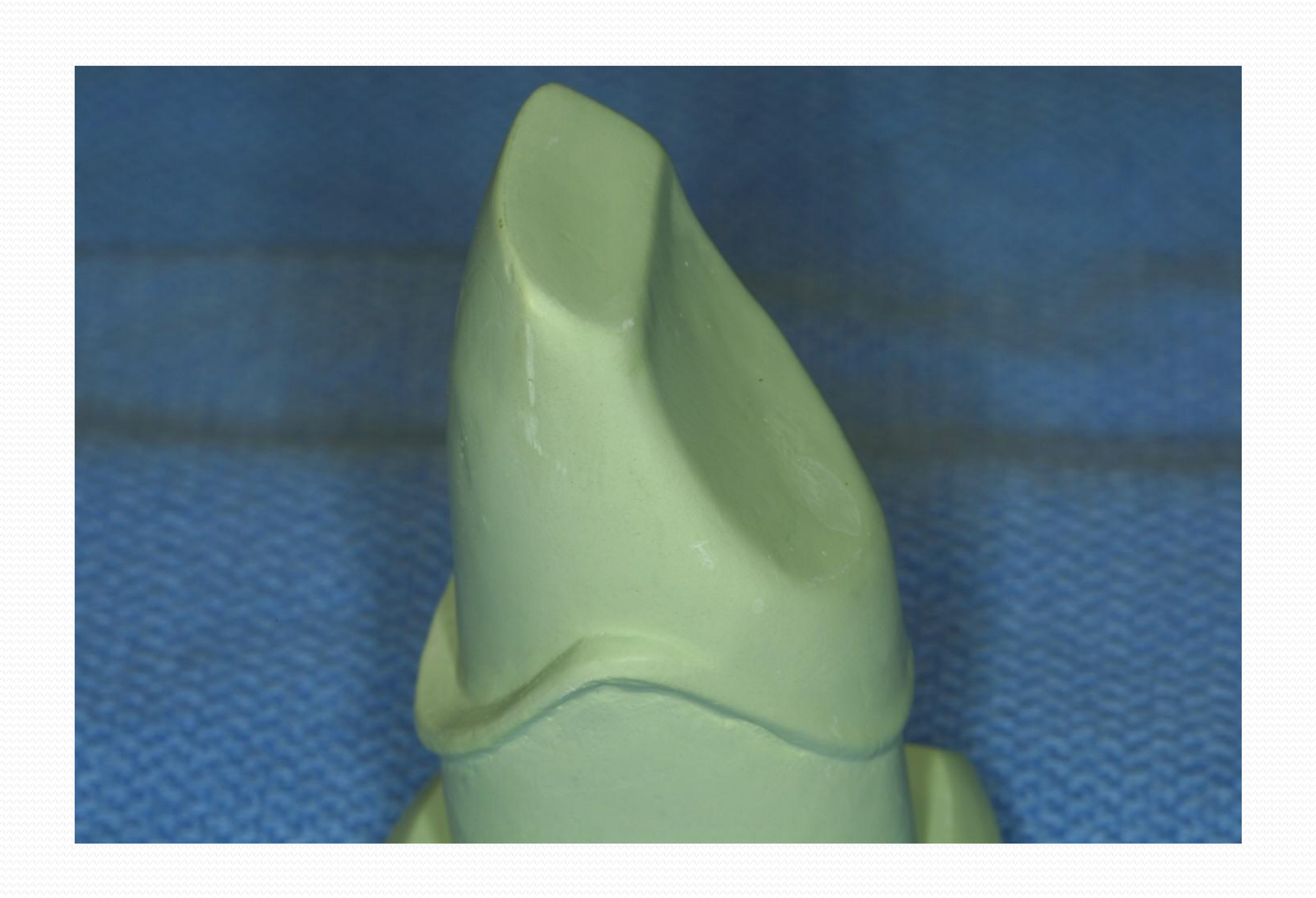
- 1- OPAQUE LAYER: a thin layer (0.2) that covers and hides the colour of the metal substructure. Applied in two coats and also it is the layer that initiats the chemical bond between and metal and porcelain

- 2- BODY OR DENTINE PORCELAIN: forms the main bulk of the porcelain layer, gives colour and some translucency.

3- ENAMEL OR INCISAL PORCELAIN: it forms the incisal and cuspal parts which is the most translucent.


metal: 0.5 mm (0.3 mm)
opaque porcelain: 0.2 mm
body porcelain: 0.5 mm
1.2 mm





THE METAL ALLOY

- IT SHOULD HAVE :
- HIGH STRENGTH , IF THE METAL BENDS UNDER FORCE THE OVERLYING PORCELAIN WILL FRACTURE
- HIGH HARDNESS TO WITHSTAND SCRATCHING
- HAVE A MELTING TEMPERATURE HIGHER THAN THE FIRING TEMPERATURE OF PORCELAIN TO PREVENT DEFORMATION (SAG RESISTANCE). THIS DIFFERNCE SHOULD BE MORE THAN 170 TO 280 °C

- A SLIGHTLY HIGHER COEFFICIENT OF THERMAL EXTACTION THAN PORCELAIN. THE OPTIMUM DIFFERNCE SHOULD BE 1 X 10-6/°C. THIS INCREASES RETENTION BETWEEN THE METAL AND PORCELAIN.
- PLATINUM AND PALADIUM ARE ADDED TO IMPROVE MECHANICAL PROPERTIES, DECREASE COEFFICIENT OF EXPANSION AND INCREASE THE MELTING RANGE OF GOLD ALLOY.
- TIN, INDIUM ARE ADDED TO GOLD TO AID IN THE FORMATION OF OXIDE LAYER TO HELP BONDING.

- NOT DISCOLOUR THE PORCELAIN
- TARNISH AND CORROSION RESISTANT

PORCELAIN REQUIREMENTS

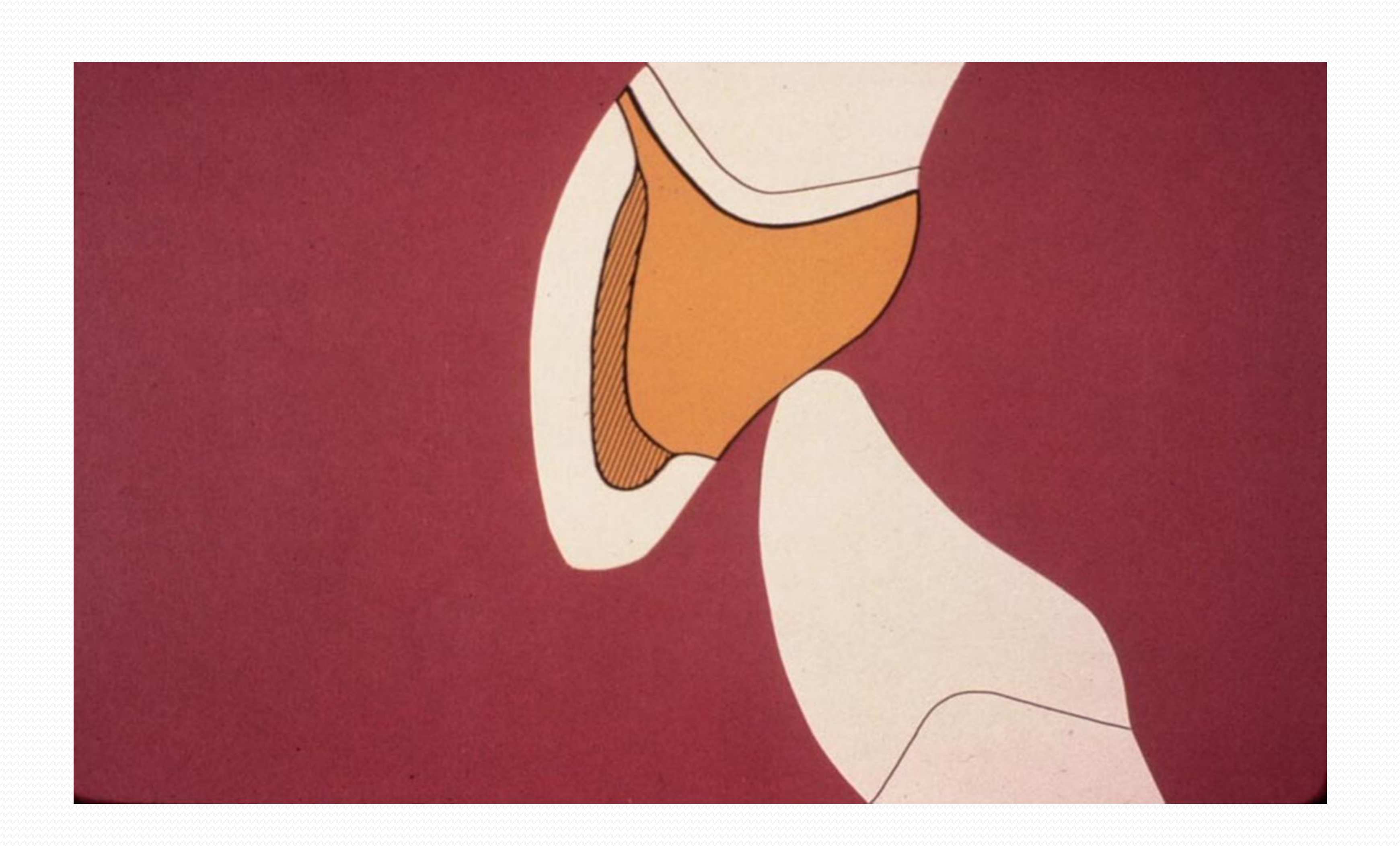
- FIRING TEMPERATURE LOWER THAN THE MELTING RANGE OF METAL ALLOY.
- COEFFICIENT OF THERMAL EXPANSION SLIGHTLY LOWER THAN THAT OF METAL.
- HIGH VISCOUSITY TO AID BUILD UP AND SHAPING (PREVENT SLUMPING)
- RESIST DIVERIFICATION: changing of porcelain colour into milky white that resists glazing

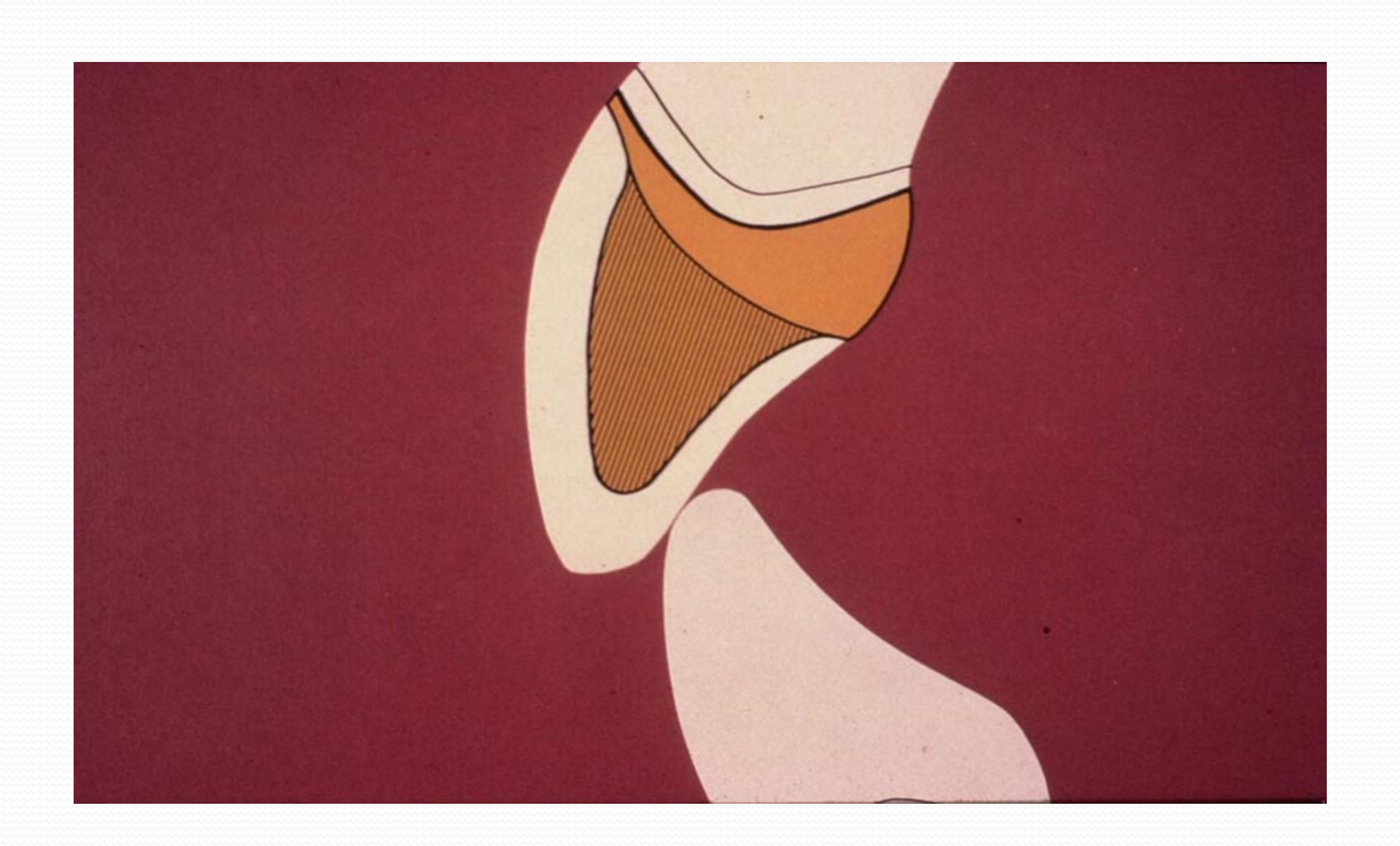
METAL- PORCELAIN BONDING MECHANISMS

- 1- MICRO-MECHANICAL BONDING:
- Due to mico roughness on the metal surface which can be done by stones, discs or sandblasting (alumina)
- 2-COMPRESSIVE STRESSES:
- Due to the mismatch coefficient of thermal expansion between the alloy and porcelain
- 3- CHEMICAL BONDING:
- Due to the oxide layer formed between the metal and porcelain. In gold alloys Tn, In, Fe migrate to the surface of the ally and bond with the opaquer layer. In base metal alloy, the elements oxidize easily so elements are added to control the oxide layer.

PRINCIPLES OF METAL SUBSTRUCTURE DESIGN

- NO SHARP LINE ANGLES, decreases stress concentration, distributes forces better and allows wetting of the metal substructure
- GIVE ADEQUATE SUPPORT OF PORCELAIN, porcelain thicker than 1.5 – 2mm can fracture.
- NO OCCLUSAL CONTACTS ON METAL/PORCELAIN INTERFACE, should be 1mm away to prevent fracture
- FACILITATE PORCELAIN WRAP AROUND, increases resistance to fracture and gives better esthetics





- CORRECT DEFICIENCIES IN TOOTH FORM
- HAVE ADEQUATE THICKNESS TO GIVE RIGIDITY, minimum 0.5mm for gold, 0.3mm for base metal alloy
- OCCLUSAL CONTACTS SHOULD BE IN METAL FOR DURABILUTY AND BIOCOMPATABILITY WITH OPPOSING TEETH (less wear)
- PROXIMAL CONTACTS SHOULD BE PORCELAIN FOR BETTER ESTHETICS

- **CERVICAL FACIAL MARGIN**:
- - IT CAN BE METAL → BETTER MARGINAL ADAPTATION
- -BUT HAS BAD ESTHETICS SO HIDE SUBGINGIVALLY WHICH CAN CAUSE INFLAMMATION.
- **CAN BE PORCELAIN (COLLARLESS)**
- METAL IS TRIMMED 1MM SHORT OF THE FINISH LINE AND SPECIAL PORCELAIN IS PLACED, SHOULDER PORCELAIN





- ADVANTAGES INCLUDE BETTER ESTHETICS, HEALTHIER GINGIVA
- DISADVANTAGES INCLUDE LESS MARGINAL ADAPTATION, LIABLE TO FRACTURE, TECHNIQUE SENSITIVE AND MORE EXPENSIVE.